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PANTECH SOLUTIONS®
Technology Beyond the Dreams

MICRO CONTROLLER BOARDS

8051 Advanced Development kit

USER MANUAL

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1. - Introduction

Thank you for purchasing the **SLICKER-8051** Kit. You will find it useful in developing your 8051 application.

SLICKER-8051 Kit, is proposed to smooth the progress of developing and debugging of various designs encompassing of High speed 8-bit MCU from NXP/Dallas/Atmel. The board supports 8051 family devices with various memory and peripheral options. It integrates on board two UARTs, LEDs, Relays, Motor Interface, keypads, an ADC input and GLCD/LCD Display to create a stand-alone versatile test platform.

1.1– Packages

- SLICKER-8051 Kit (NXP - P89V51RD2 MCU)
- Serial Port Cable | Parallel Cable for Atmel
- Printed User Manual
- 10-PIN FRC cables
- CD contains
- Software (Programmers, IDE)
    - Example Programs

      User Manual

1.1- Technical or Customer Support

E-mail questions to

support@pantechsolutions.net

Send questions by mail to

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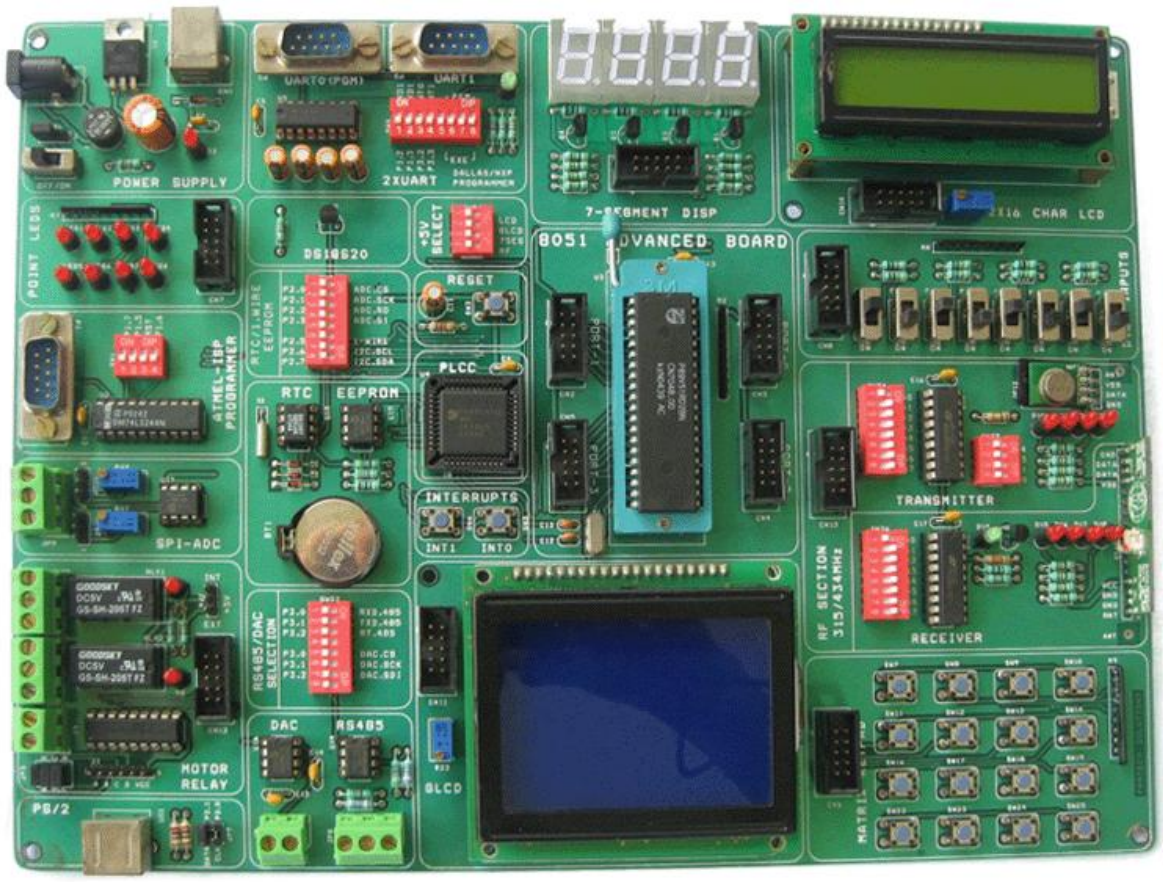
1.3 - Board Introduction

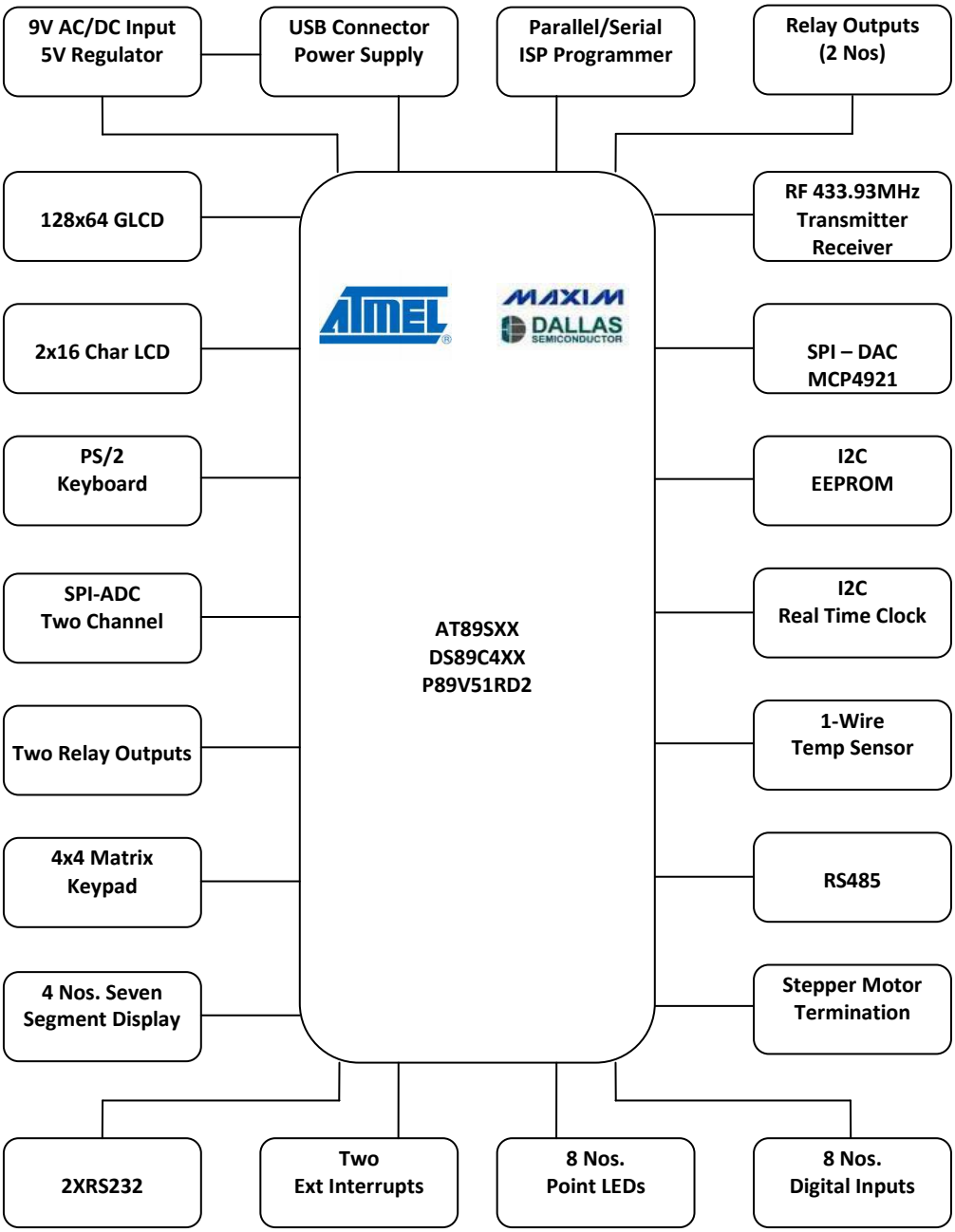
Pantech Solutions' Embedded Advanced Development module is proposed to smooth the progress of developing and debugging of various designs encompassing 8051 Microcontrollers from Philips / Atmel/ Dallas. The intention of the design is to endorse the engineers to exercise and explore the capabilities of 8051 microcontrollers with many communication protocol ease**.** The board is compatible with 40-DIP/44-PLCC pin Microcontrollers. The kit is designed so as to facilitate separate **On-board ISP** Programmer for Atmel microcontrollers and Philips Microcontroller

through ISP on serial port. Programming can be done without detaching the Microcontroller from the ZIF socket.



It provides a complete development platform with different modules interface that accelerates the task of designers to run application software on target 8051 hardware, thereby paving a platform to benchmark their system, save time & expense of building their own application test board and enabling them to get their designs to market quickly. Many real world applications can be tested on the board. RS485, RTC, DAC, Digital Temperature controllers, Motor drivers, Memory interfacing, counters, timers...

General Block Diagram



Specifications

- **Supported Microcontrollers :**

SOCKET1 (40-DIP)

Atmel : AT89S51/52/8252 and AT89Sxx

NXP : P89V51Rxx

Dallas : DS89C420/430/450

SOCKET2 (44-PLCC)

Atmel : AT89S51/52/8252 and AT89Sxx MCUs

NXP : P89V51Rxx

Dallas : DS89C420/430/450

- **External Peripheral Modules**

  - 128X64 GLCD Interface
  - 2x16 Character LCD with Contrast adjust
  - 4-Nos. of common anode seven segment display
  - 8-Nos. General purpose Point LEDs
  - 8-Nos. of Toggle switches (Digital Inputs)
  - 4x4 Matrix keypad
  - Stepper Motor Driver Output
  - Two Nos. of 5V Relay with termination
  - PS/2 keyboard Interface
  - RF 433.92MHz Transmitter/Receiver

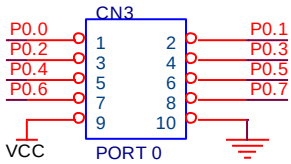
- **Communication Protocols**
  - I2C Two Wire Interface (Philips-NXP)
  - SPI (Motorola)
  - 1-wire Technology (Maxim-Dallas)
  - Two Full Duplex UART (EIA)
  - RS485 (EIA)

- **Other Features**

  - Analog to Digital Converter
  - Digital to Analog Converter
  - Real Time Clock with Battery Backup
  - Serial EEPROM memory
  - RF 433.92MHz Transmitter/Receiver
  - Digital Temperature sensor
  - RS485 serial communication through long distance(>200m)
  - Two UART for serial port communication through PC.
  - ISP In-System Programming for NXP, Dallas controllers.
  - Parallel programmer for Atmel AT89S5X family controllers.
  - Two pushbuttons for Interrupts study.
  - Easy to mount 40-pin DIP Devices (ZIF socket).
  - Controlling of multifunction through DIP Switch.

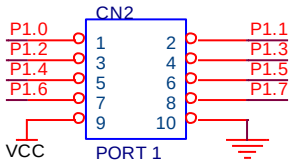
2. Connectors and Jumper Details

CN3 - 10PIN Box Header (PORT 0)



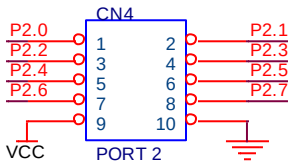
Connector Pin Numbers	MCU Pin Name	Connector Pin Numbers	MCU Pin Name
1	P0.0	2	P0.1
3	P0.2	4	P0.3
5	P0.4	6	P0.5
7	P0.6	8	P0.7
9	VCC	10	GND

CN2 - 10PIN Box Header (PORT 1)



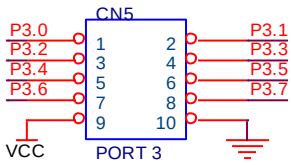
Connector Pin Numbers	MCU Pin Name	Connector Pin Numbers	MCU Pin Name
1	P1.0	2	P1.1
3	P1.2	4	P1.3
5	P1.4	6	P1.5
7	P1.6	8	P1.7
9	VCC	10	GND

CN4 - 10PIN Box Header (PORT 2)



Connector Pin Numbers	MCU Pin Name	Connector Pin Numbers	MCU Pin Name
1	P2.0	2	P2.1
3	P2.2	4	P2.3
5	P2.4	6	P2.5
7	P2.6	8	P2.7
9	VCC	10	GND

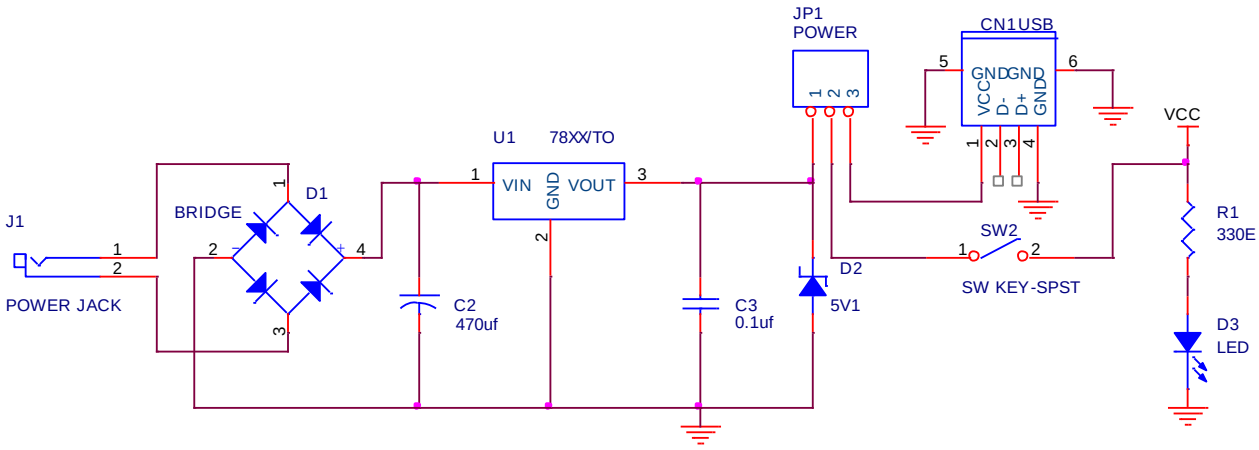
CN5 - 10PIN Box Header (PORT 3)



Connector Pin Numbers	MCU Pin Name	Connector Pin Numbers	MCU Pin Name
1	P3.0	2	P3.1
3	P3.2	4	P3.3
5	P3.4	6	P3.5
7	P3.6	8	P3.7
9	VCC	10	GND

3. Power Supply

The external power can be AC or DC, with a voltage between (9V/12V,1A output) at 230V AC input. The 8051 board produces +5V using an LM7805 voltage regulator, which provides supply to the entire device on the board. USB socket meant for power supply only, user can select either USB or Ext power supply through JP1. Separate On/Off Switch for controlling power to the board.



4. MCU Sockets

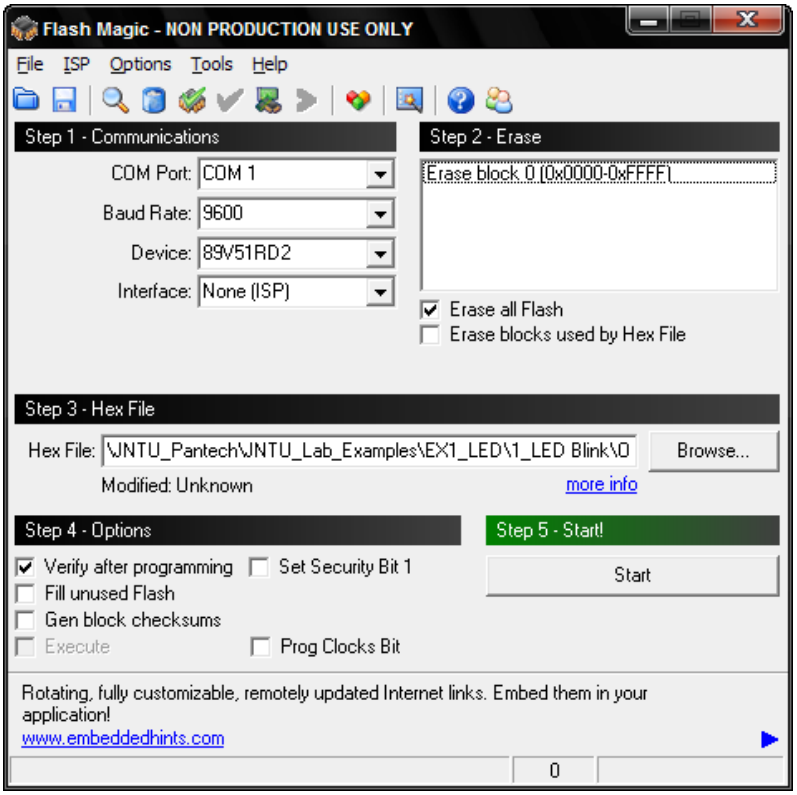
- The 8051-development board is delivered with ATMEL's 40-pin & 44pin CAN Controller Microcontroller. User can remove this and fit different microcontroller DIP40 packages of an adequate pin out.

- NOTE : Since all packages have parallel connections, there must not be more than
  one microcontroller on the board at a time.

5. Flash Programming Utility

1. NXP (Philips)

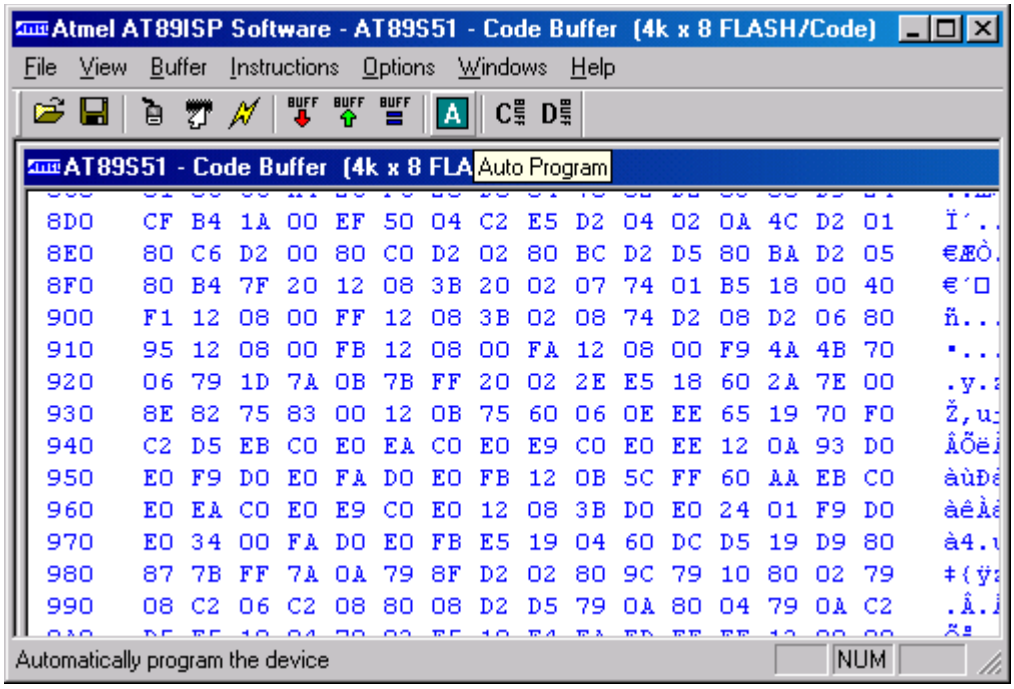
NXP Semiconductors produce a range of Microcontrollers that feature both on-chip Flash memory and the ability to be reprogrammed using In-System Programming technology.



Note : Detailed Manual available at “Flash Magic” Help menu - Manual.

2. ATMEL Microcontroller ISP

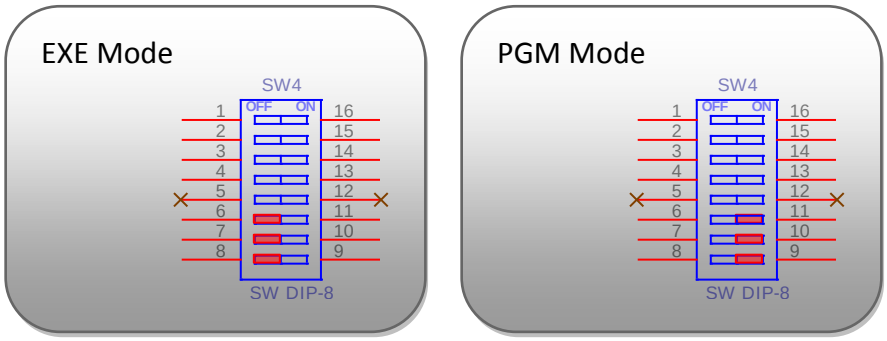
Note : Atmel Microcontrollers (PGM mode), user can select switch settings to color shaded position. (EXE Mode) disable switches to off position.



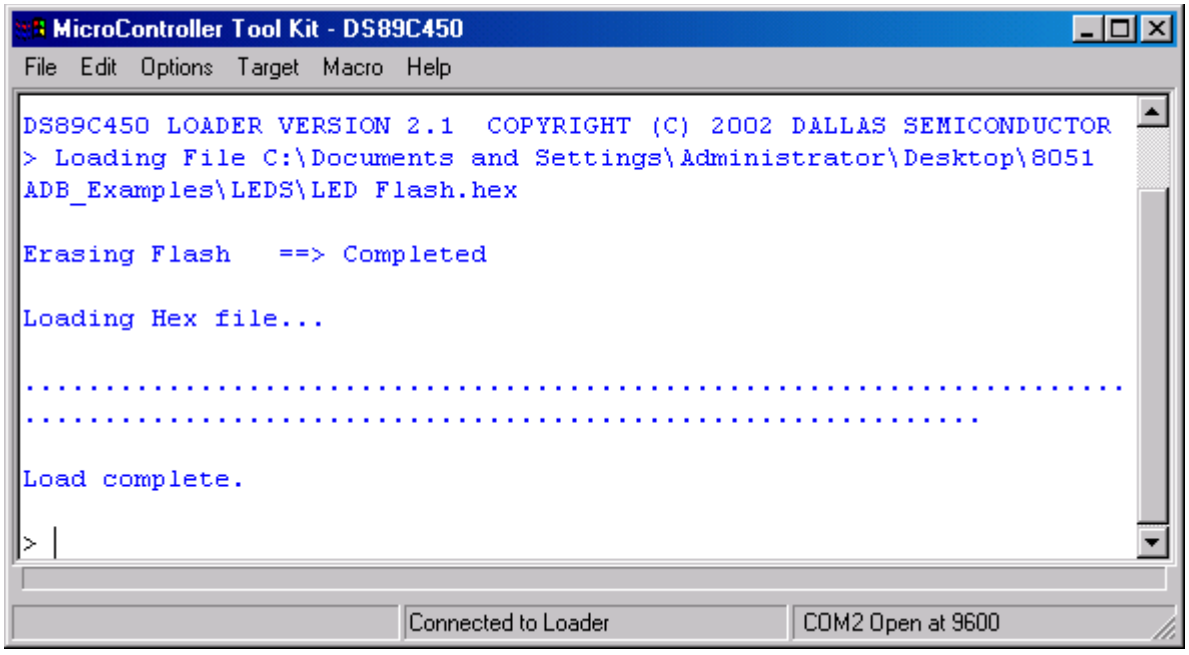
Note : Detailed Manual available for

\8051ADB\Softwares\Programmers\AT89ISP\User Manual.pdf

3. Dallas Microcontroller ISP



Note : Dallas Microcontrollers (PGM mode), user can select switch settings to color shaded position.(EXE Mode) disable switches to off position.


MicroController Tool Kit - DS89C450
File Edit Options Target Macro Help
DS89C450 LOADER VERSION 2.1 COPYRIGHT (C) 2002 DALLAS SEMICONDUCTOR
> Loading File C:\Documents and Settings\Administrator\Desktop\8051 ADB_Examples\LEDS\LED Flash.hex
Erasing Flash ==> Completed
Loading Hex file...
Load complete.
>
Connected to Loader
COM2 Open at 9600

6. On-board Peripherals

The Development board comes with many interfacing options

- 8-Nos. of Point LED's (Digital Outputs)
- 8-Nos. of Slide switches (Digital Inputs)
- 2 Lines X 16 Character LCD Display
- 128X64 GLCD Interface
- Real Time Clock with battery backup
- 4 Nos. of Seven-segment display
- Digital Temperature Sensor
- 4 X 4 Matrix keypad
- Relay / Stepper Motor driver circuit
- SPI Digital to Analog Converter
- Serial EEPROM memory
- RS485 serial communication through long distance(>200m)

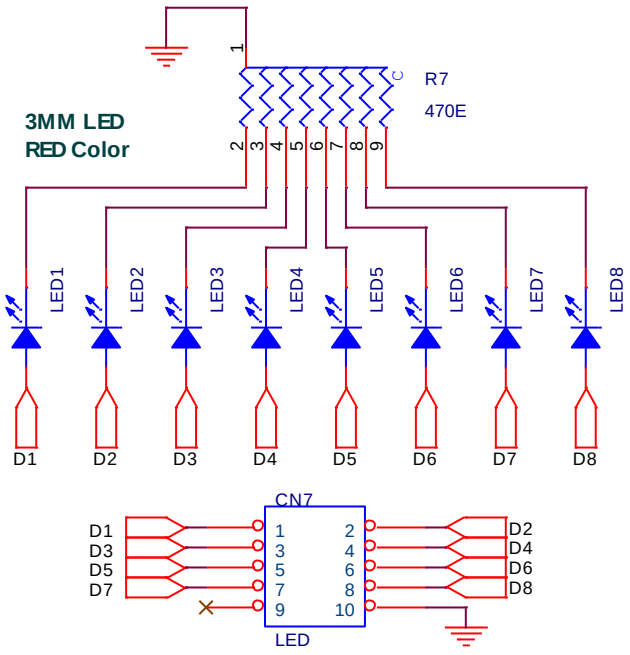
- Two UART for serial port communication through PC
- PS/2 keyboard Interface
- RF 433.92MHz Transmitter/Receiver
- SPI Analog / Digital Converter

6.1 - Light Emitting Diodes

- Light Emitting Diodes (LEDs) are the most commonly used components, usually for displaying pin's digital states.

- The 8051 Advanced Development kit has 8 nos., of Point LED, user can interface the point LEDs with any port. User can use P0, P1, P2 and P3 ports.

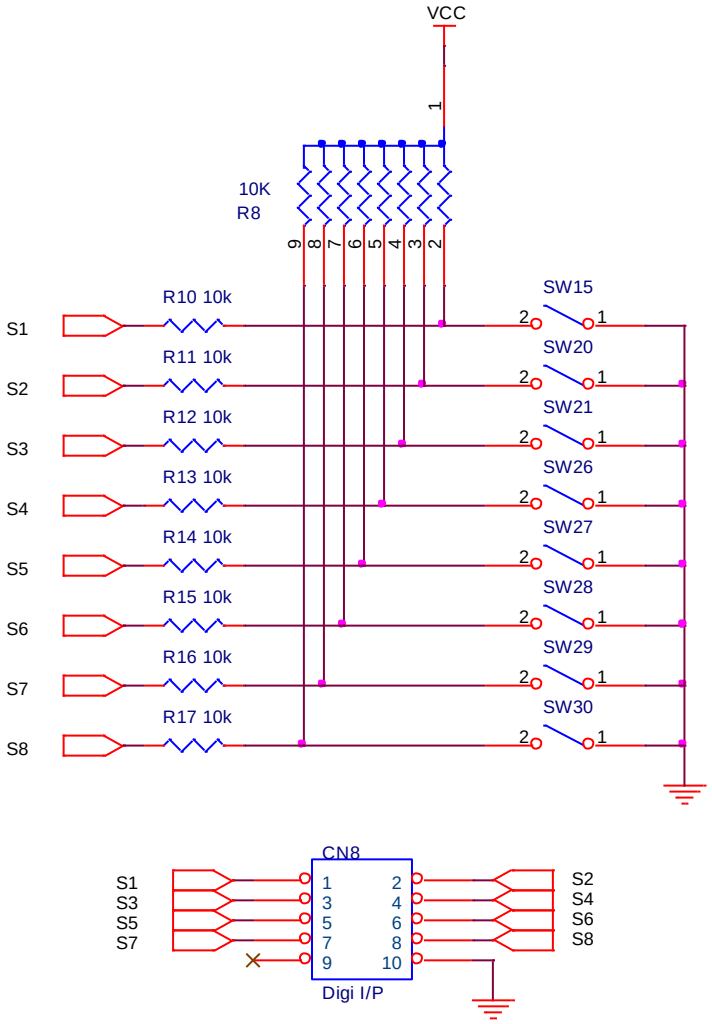
- Connector CN7 for LED connector, when **High** Level goes to the pin LED glows.



6.2 – Digital Inputs Slide Switch

- This is another simple interface, 8-Nos. of toggle switch, mainly used to give an input to the port lines, and for some control applications also.

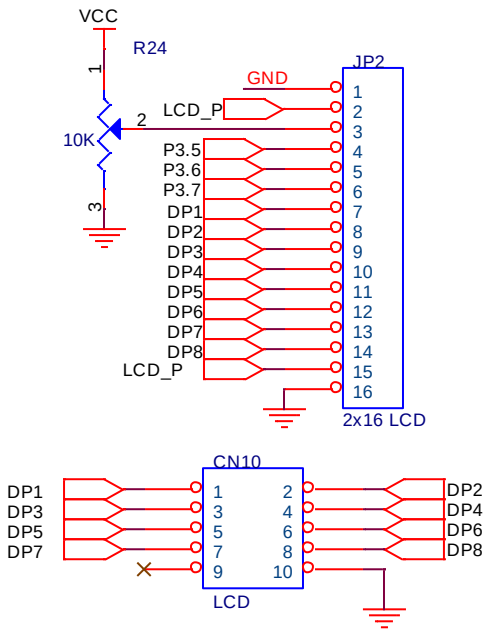
- All the lines are pulled-up, when make to switch ON, it goes to low logic to the i/o pins.



6.3 - LCD 2x16 In 8-Bit Mode

- When using a character LCD in an 8-bit mode, the connector CN10 connects the LCD to Microcontroller port lines. User can use LCD Data lines to Port P0, P1 and P2, not P3, because P3 lines P3.5 (RS), P3.6(R/W) and P3.7 (Enable) connected by default. The LCD's contrast can be adjusted by varying the trimpot(R24).

- Place 2x16 Character LCD to proper place, mentioned legend in PCB.



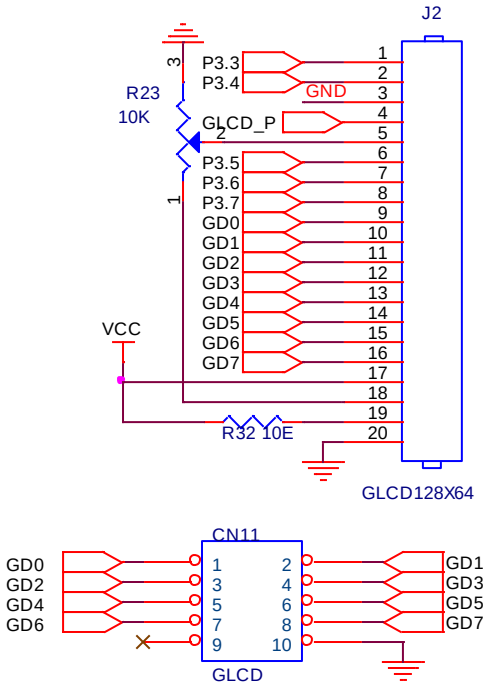
Note: Possible ways to interface LCD (**Not CN5**).

	LCD CON	**MCU CON**
1.	CN10	CN2
2.	CN10	CN3
3.	CN10	CN4

6.4 - 128X64 Graphic LCD

- When using a Graphic LCD, the connector CN11 connects the LCD to Microcontroller port lines. User can use GLCD Data lines to Port P0, P1 and P2, not P3, because P3 lines P3.3(CS1), P3.4(CS2), P3.5(RS), P3.6(R/W) and P3.7 (Enable) connected by default. The LCD's contrast can be adjusted by varying the trimpot(R23).

- Place GLCD to proper place, mentioned in PCB.

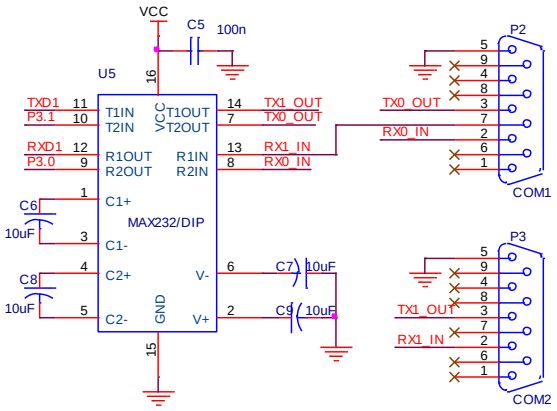


Note: Possible ways to interface LCD (**Not CN5**).

	LCD CON	**MCU CON**
1.	CN11	CN2
2.	CN11	CN3
3.	CN11	CN4

6.5 - RS-232 Communication

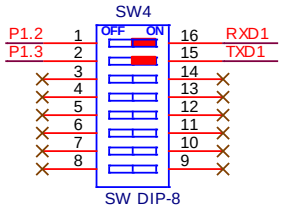
- RS-232 communication enables point-to-point data transfer. It is commonly used in data acquisition applications, for the transfer of data between the microcontroller and a PC.
- The voltage levels of a microcontroller and PC are not directly compatible with those of RS-232, a level transition buffer such as MAX232 be used.



☞: Note : UART0 (PGM) lines connected directly through MCU pins(RXD0, TXD0). For serial

communication use UART0(P2).

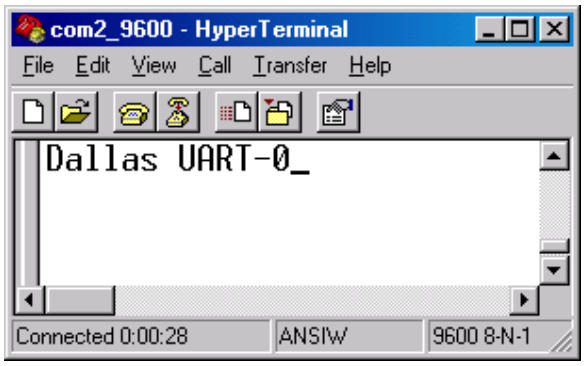
☞: Note : Make switch positions UART1(P1) for **Dallas MCU** Only.

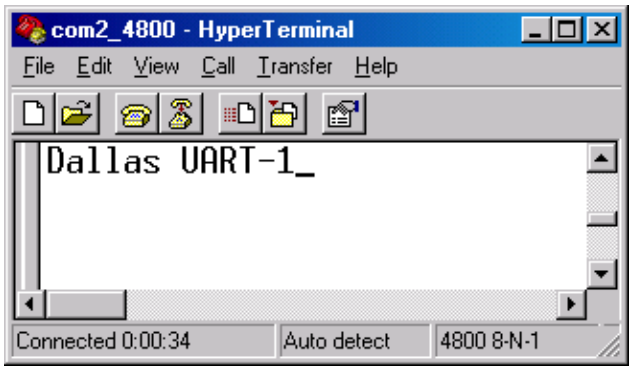


Note : Dallas MCU User can't set 9600 baud rate for both the UART0 and UART1

PORT0(P1) - 9600 baudrate

PORT1(P2) – 4800 baudrate

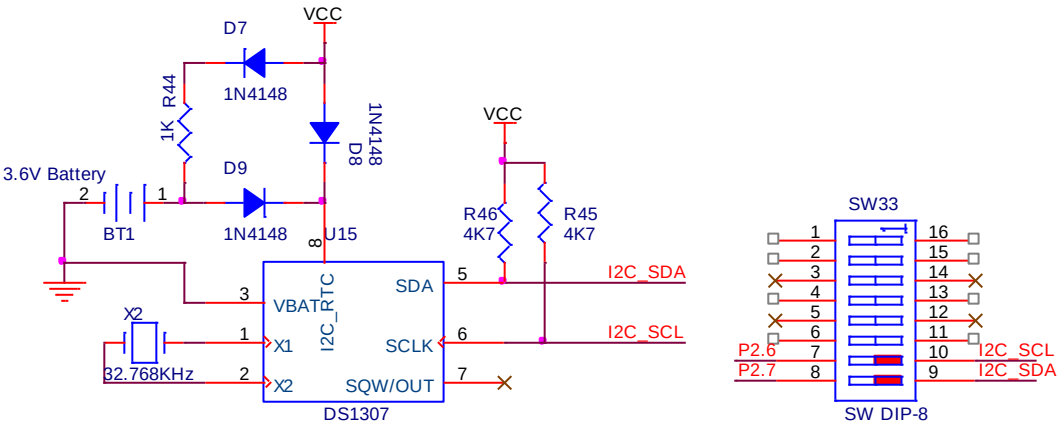




6.6 - Real Time Clock

The DS1307 Serial Real-Time Clock is a low power; full binary-coded decimal (BCD) clock/calendar plus 56 bytes of NV SRAM. The DS1307 has a built-in power sense circuit that detects power failures and automatically switches to the battery supply. In Embedded module's DS1307 of pin SDA and SCL connected to the Microcontroller's pin **P2.6** and **P2.7** respectively. Address and data are transferred serially via a 2-wire, bi-directional bus. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month/ date is automatically adjusted for months with fewer than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with AM/PM indicator.

This RTC circuit is facilitated with Battery backup, when supply fails; battery voltage goes to DS1307 RTC chip.



Note: Before using RTC make switch settings like above mentioned.

6.7 – Serial EEPROM

The AT24C01A/02/04/08/16 provides 1024/2048/4096/8192/16384 bits of serial electrically erasable and programmable read-only memory (EEPROM) organized as 128/256/512/1024/2048 words of 8 bits each. The device is optimized for use in many industrial and commercial applications where low-power and low-voltage operation are essential. Lines CLK(P2.6) and SDA(P2.7) connected for I2C communication.

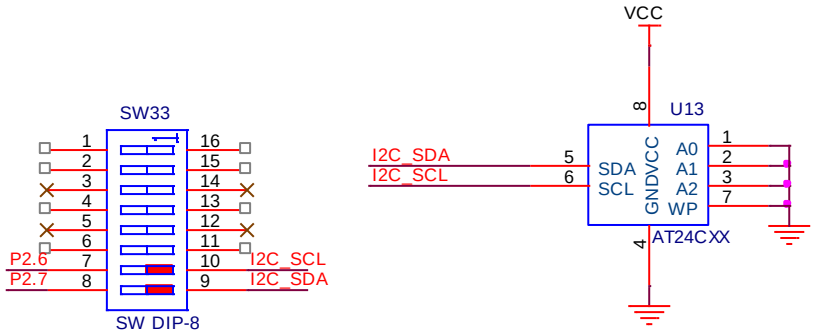
Features of AT24Cxx:

- Internally Organized 128 x 8 (1K), 256 x 8 (2K), 512 x 8 (4K)
- 2-wire Serial Interface
- Schmitt Trigger, Filtered Inputs for Noise Suppression
- Bi-directional Data Transfer Protocol
- 100 kHz (1.8V, 2.5V, 2.7V) and 400 kHz (5V) Compatibility

- Write Protect Pin for Hardware Data Protection
- 8-byte Page (1K, 2K), 16-byte Page (4K, 8K, 16K) Write Modes
- Partial Page Writes are Allowed
- Self-timed Write Cycle (10 ms max)
- High-reliability

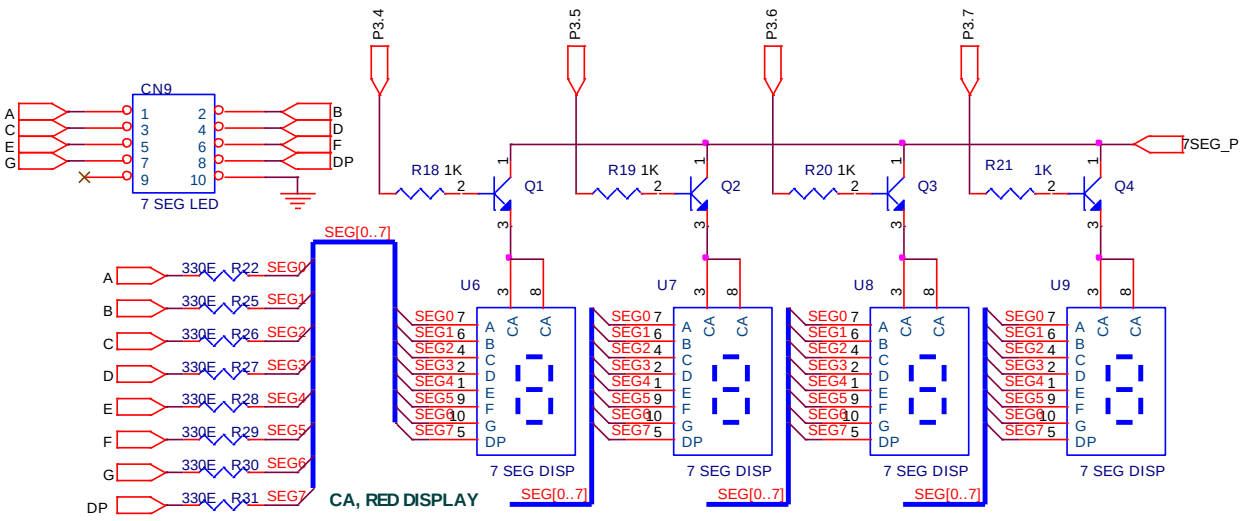
– Endurance: 1 Million Write Cycles

– Data Retention: 100 Years



6.8 - Seven Segment Display

In Embedded module 4 nos. of common anode seven segment displays are used. The segment lines of seven segments LED is being terminated at connector CN9. The digit select lines are connected to the port pins of 8051 by using BC547. All the common anode displays consume very small amount of current. User can use segment lines at any port P0, P1 and P2, by default digit select lines connected to Port P3 of Pin3.4 to P3.7.

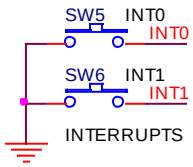


- User can connect 7-seg Data lines following possible ways (**Not CN5**).

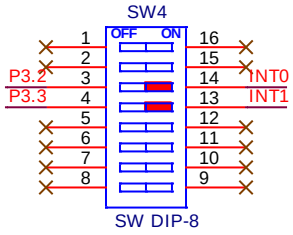
7 SEG CON	**MCU CON**
CN9	CN2
CN9	CN3
CN9	CN4

6.9 - Interrupts

Microcontroller's two external interrupts lines are terminated at switches SW5 (INT0) and SW6 (INT1).



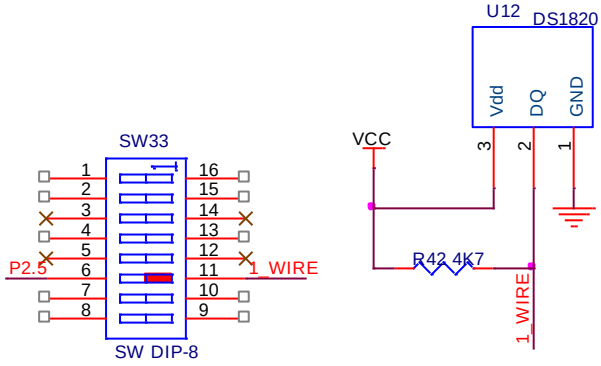
Note: While using interrupt P3.2 make high (on) to SW4 for Interrupt 0, P3.3 make (on) to SW4 for interrupt 1.



6.10 - DS1820 Digital Thermometer

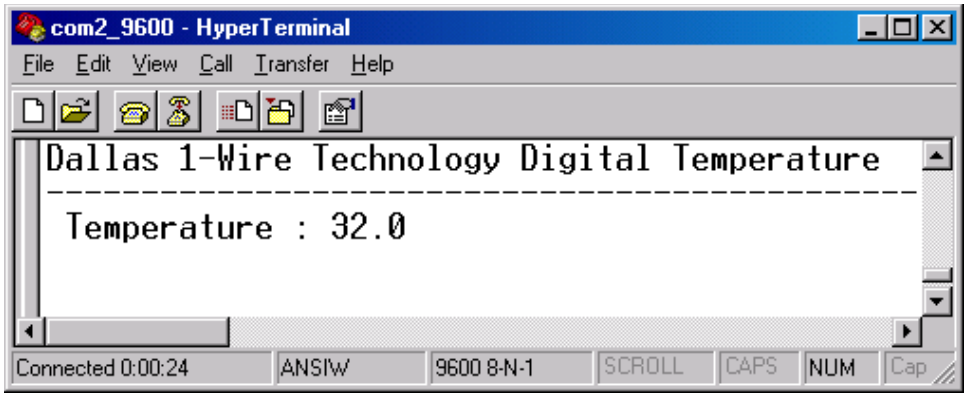
- The DS1820 digital thermometer is well suited to environmental temperature measurement, having a temperature range of –55C to 125C and an accuracy of +/-0.5C.

- It must be placed correctly in the 3-pin socket in the 8051; otherwise the DS1820 could be permanently damaged.
- DS18S20 sensor output connected to MCU's Port Pin P2.5, to enable switch SW33.



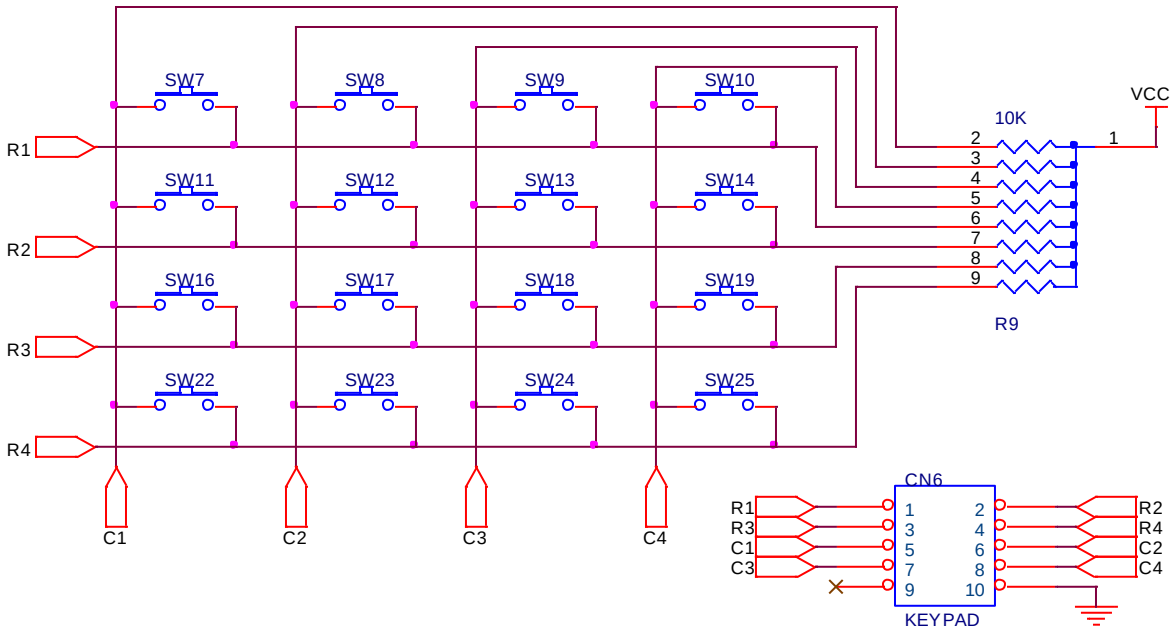
Features

- Unique 1-Wire interface requires only one port pin for communication
- Multi-drop capability simplifies distributed temperature sensing applications
- Can be powered from data line. Power supply range is 3.0V to 5.5V
- Measures temperatures from -55°C to +125°C (-67°F to +257°F)
- ±0.5°C accuracy from -10°C to +85°C
- 9-bit thermometer resolution, Converts temperature in 750ms (max.)



6.11 - 4x4 Matrix keypad

Keypads arranged by matrix format, each row and column section pulled by high, all row and column lines terminated at CN6.

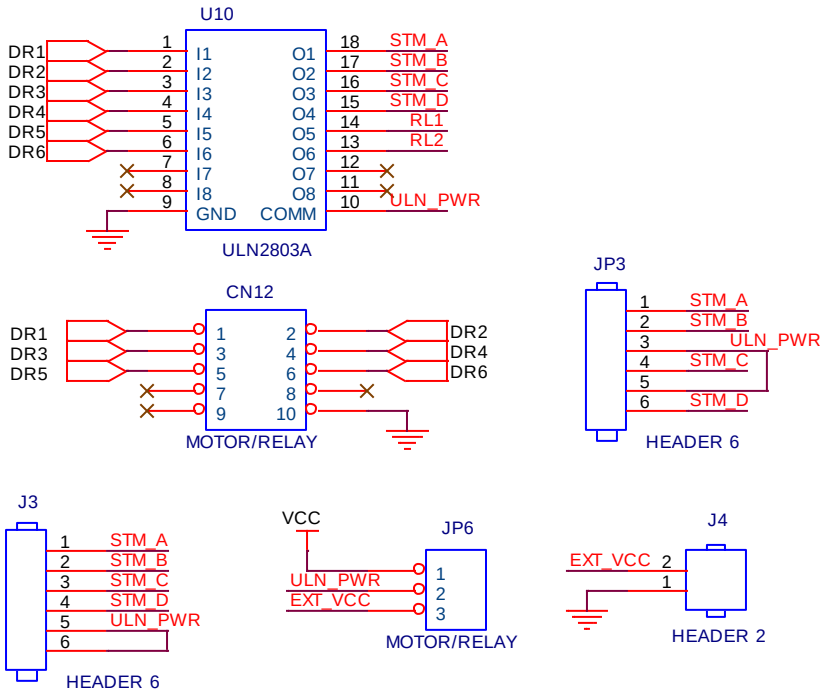


6.12 - Motor / Driver Section

The ULN2803A is a high-voltage, high-current Darlington transistor array. The device consists of eight NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of each Darlington pair is 500mA. The Darlington pairs may be connected in parallel for higher current capability.

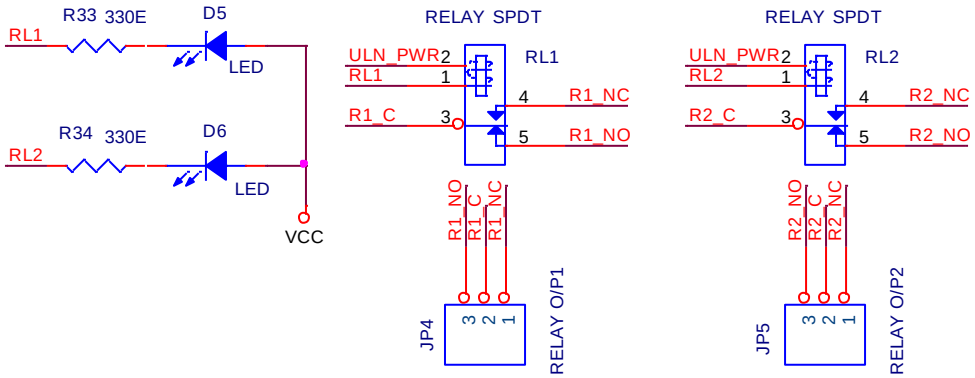
ULN2803 is used as a driver for port I/O lines, drivers output terminated to connector CN12, there can interface relay/stepper motor or any driving source could need more than 50mA. Motor can connect JP3 or J3 connector.

Note : User select Internal VCC or External through JP6 header.



6.13 - Relay Section

In ADB Board two no. Of SPDT relays are used. Both the relays operate on 5V DC. The outputs of both the terminals of the relay are taken out on the connecter to connect the external circuitry. The relay can be connected to the Microcontroller through any of the selected port (P0.4 & P0.5) or (P1.4 & P1.5) or (P2.4 & P2.5) by using the FRC connecter.



6.14 - SPI DAC

The Microchip Technology Inc. MCP492X are 2.7 – 5.5V, low-power, low DNL, 12-Bit Digital-to-Analog Converters (DACs) with optional 2x buffered output and SPI interface.

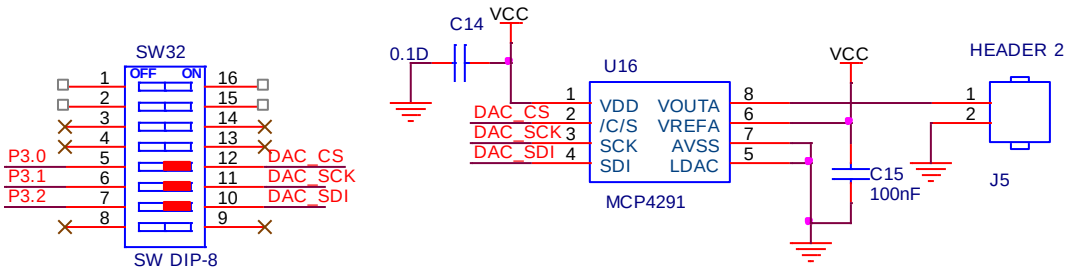
The MCP492X are DACs that provide high accuracy and low noise performance for industrial applications where calibration or compensation of signals (such as temperature, pressure and humidity) are required.

Features

- 12-Bit Resolution
- ±0.2 LSB DNL (typ), ±2 LSB INL (typ)
- Single or Dual Channel
- SPI™ Interface with 20 MHz Clock Support
- Simultaneous Latching of the Dual DACs w/LDAC
- Fast Settling Time of 4.5 µs
- Selectable Unity or 2x Gain Output
- 450 kHz Multiplier Mode
- External VREF Input
- Extended Temperature Range: -40°C to +125°C

Hardware connections

SPI DAC - P3.0 (CS), P3.1(SCK) and P3.2(SDI) to make switch SW32 ON for SPI DAC Selection



6.15 - RS485

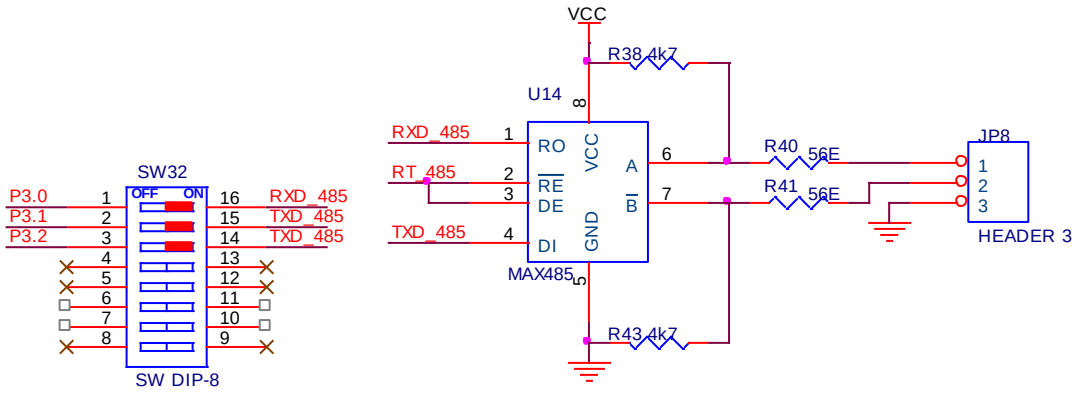
The Max485 is a differential line transceiver suitable for high speed bidirectional data communication on multipoint bus transmission lines. It is designed for balanced data transmission and complies with EIA Standards RS-485 and RS-422. The part contains a differential line driver and a differential line receiver. Both the driver and the receiver may be enabled independently.

Features

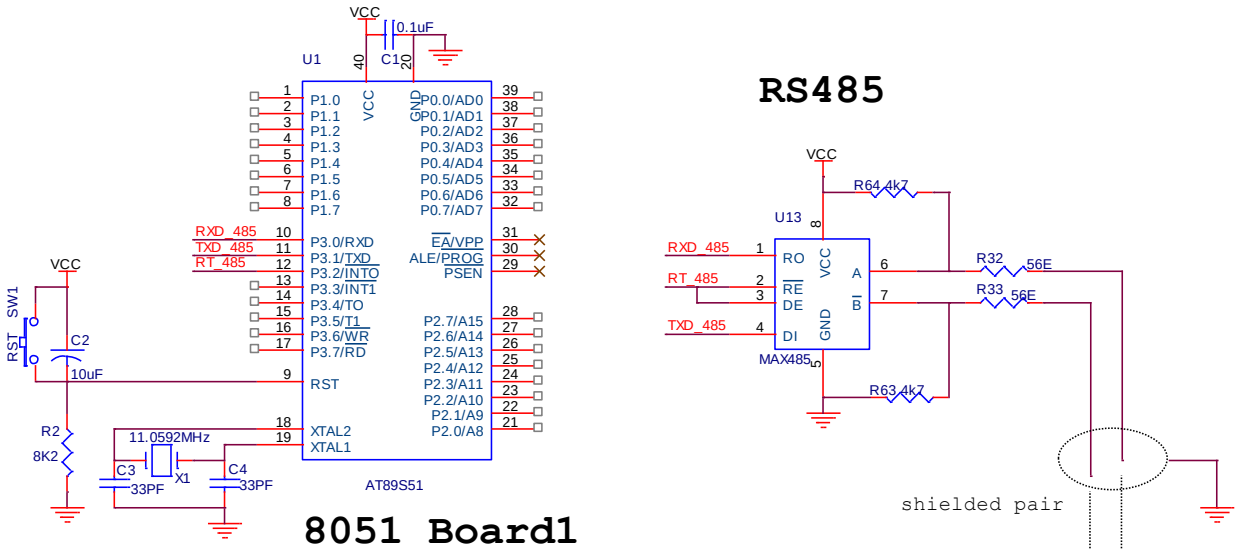
- Meets EIA RS-485 Standard
- 5 Mbps Data Rate
- Single 5 V Supply
- –7 V to +12 V Bus Common-Mode Range
- High Speed, Low Power BiCMOS
- Thermal Shutdown Protection
- Short-Circuit Protection
- Driver Propagation Delay: 10 ns
- Receiver Propagation Delay: 15 ns
- High Z Outputs with Power Off

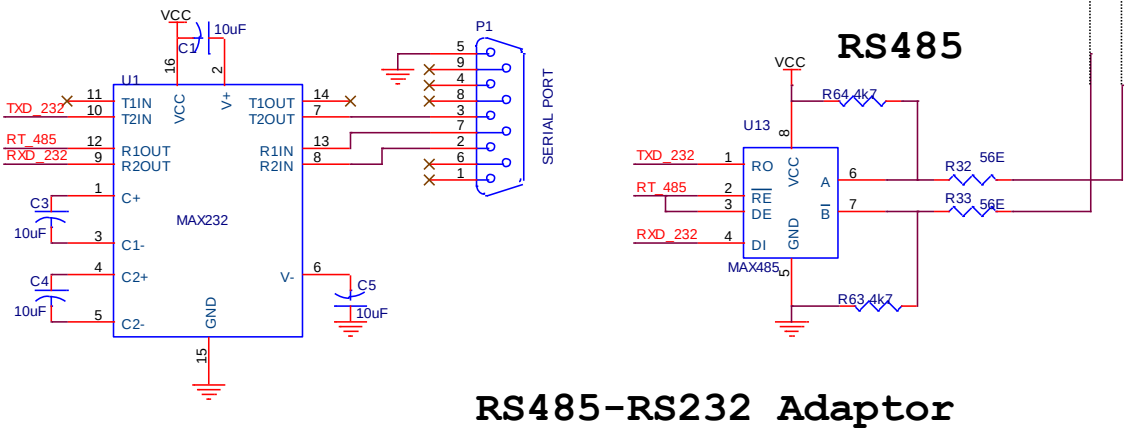
Hardware connections

RS485- P3.0 (RXD), P3.1(TXD) and P3.2(RT) to make switch SW32 ON for **RS485** Selection



Application Schematic





RS485-RS232 Adaptor

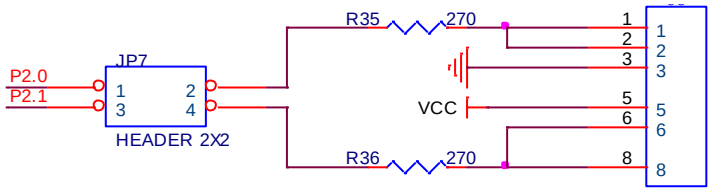
Exemple Code

\Examples Code\RS485\send\out\send.hex

\Examples Code\RS485\receive\out\receive.hex

6.16 - PS/2 Interface

User can connect PS/2 Devices like keyboard, mouse to the 8051 ADB board. PS/2's DATA(P2.1) and CLK(P2.0) lines connected to MCU's Port Lines. for example keyboard connected to the ADB board it act as a pc keyboard, pressed key code displayed in LCD or PC's Hyper Terminal window.

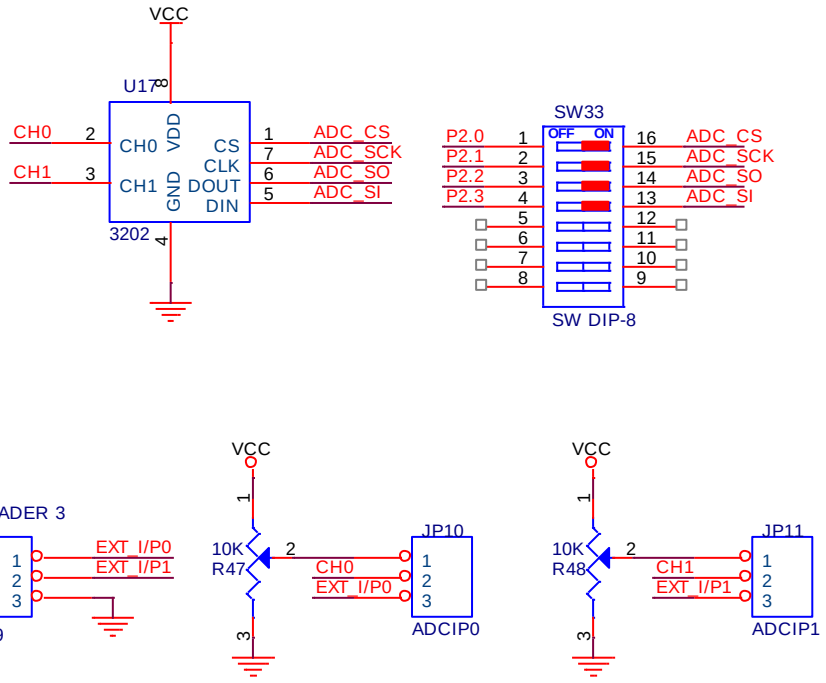


6.17 – Analog / Digital Convertor (SPI ADC)

The Microchip Technology Inc. MCP3202 is a successive approximation 12-bit Analog-to-Digital (A/D) Converter with on-board sample and hold circuitry. The MCP3202 is programmable to provide a single pseudo-differential input pair or dual single-ended inputs. Differential Nonlinearity (DNL) is specified at ±1 LSB, and Integral Nonlinearity (INL) is offered in ±1 LSB (MCP3202-B) and ±2 LSB (MCP3202-C) versions. Communication with the device is done using a simple serial interface compatible with the SPI protocol. The device is capable of conversion rates of up to 100ksps at 5V and 50ksps at 2.7V.

Hardware Connections

ADC - P2.0 (CS), P2.1(SCK), P2.2(SDO) and P2.3(SDI) to make switch SW33 ON for ADC Selection



6.18 – RF433.92MHz

Radio Frequency, any frequency within the electromagnetic spectrum associated with radio wave propagation. When an RF current is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. Many wireless technologies are based on RF field propagation.

Receiver Module

Transmitter Module

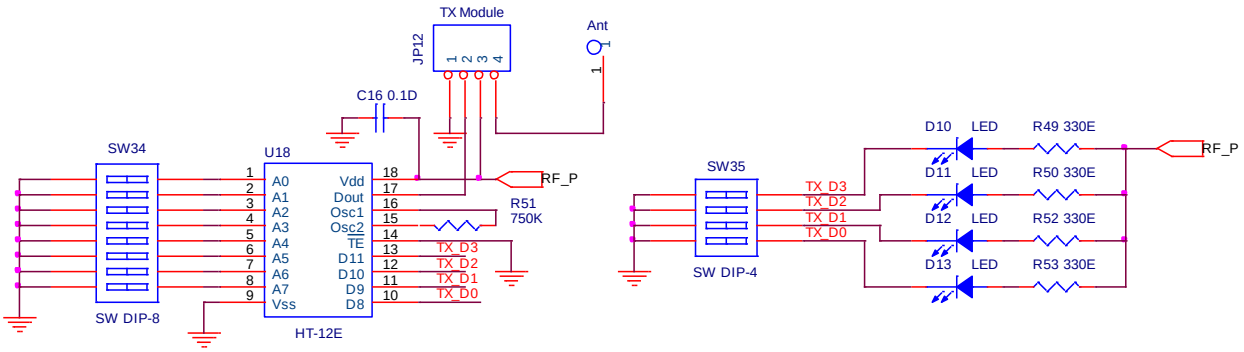
Application Areas

- Wireless mouse, keyboard
- Wireless data communication
- Alarm and security systems
- Home Automation, Remote control
- Automotive Telemetry
- Intelligent sports equipment
- Handheld terminals, Data loggers
- Industrial telemetry and Telecommunications
- In-building environmental monitoring and control
- High-end security and fire alarms

Transmitter Section

RF433.92MHz transmitter Module conneted with 4-bit encoder, user can evaluated RF interface in two ways (Standalone without MCU, user can give inputs through 4-way DIP switchSW35) while making switch SW35 to ON positions inputs low goes to the encoder. Data will transmit through the module. Also provided to configure address lines of the encoder.

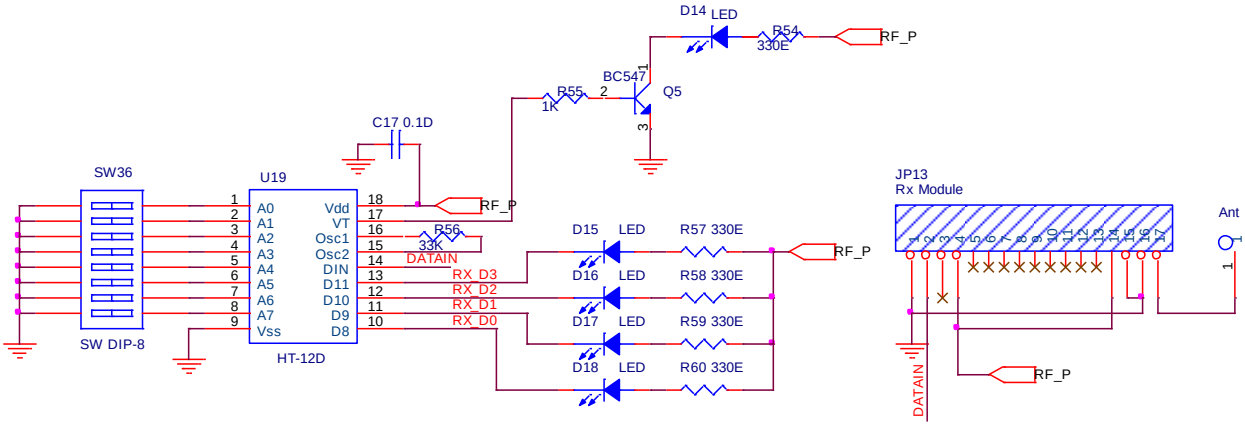
Note : While RF Testing set same addresses for both transmitter section (encoder)/Receiver section (decoer).



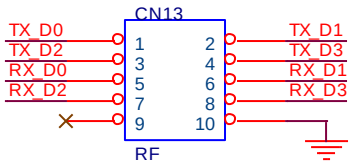
Receiver Section

RF433.92MHz Receiver Module connected with 4-bit decoder, user can evaluated RF signal with the help of LED indications. Whenever receives data through transmitter **VT** LED, indicates for valid transmission.

Note : While RF Testing set same addresses for both tranitter section (encoder)/Receiver section (decoer).

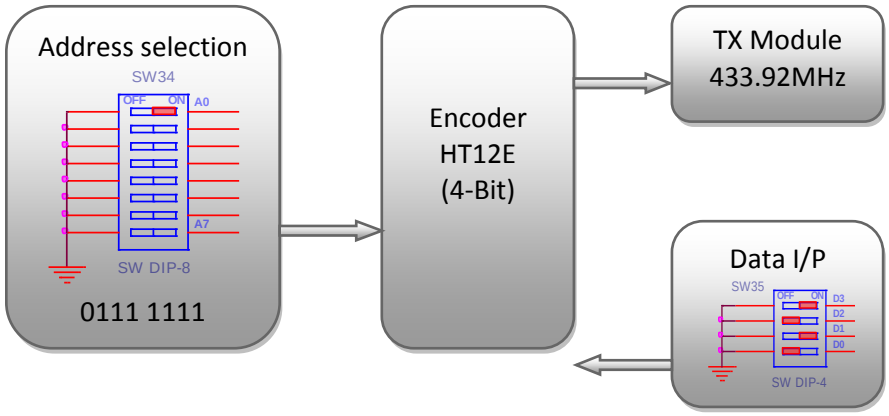


RF Interface connector

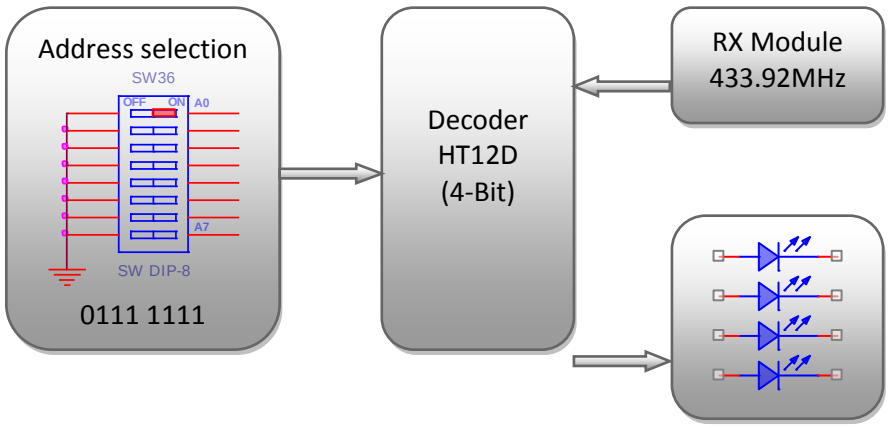


1. Application Schematic without Microcontroller

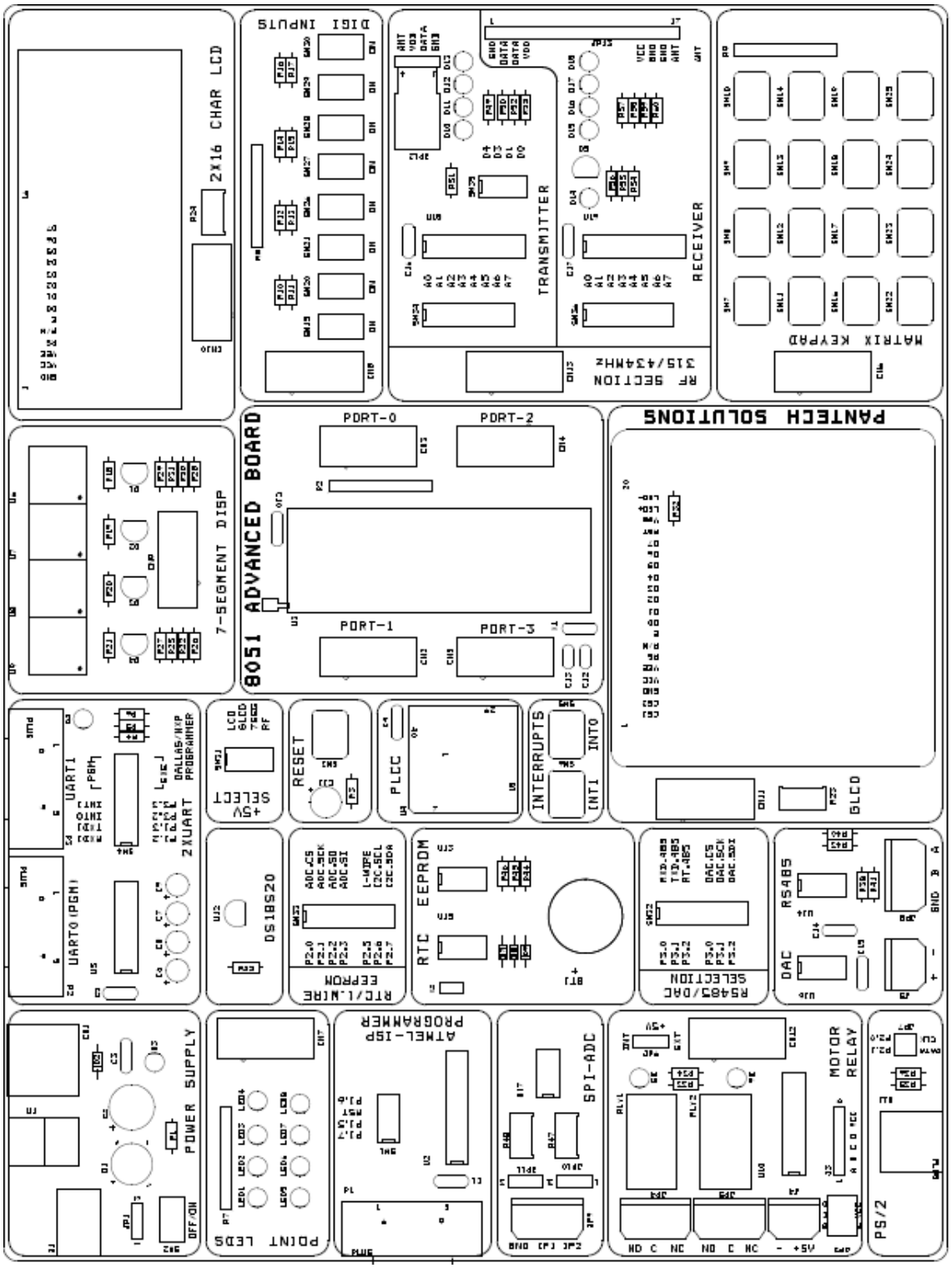
Transmitter Section



Receiver Section



7. Board Layout



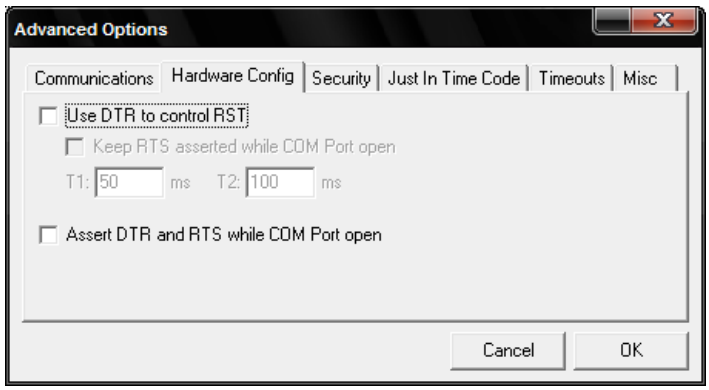
8. Easy Programming Steps - Philips/NXP Microcontrollers

Software Settings

1. open "**Flashmagic**" isp software

Step 0 : Go to "**Options**" Menu, then choose "**Advanced Options**", Advanced options windows appears.

Choose "**Hardware Config**" tab, *Deselect* "Use DTR to Control RST" checkbox.

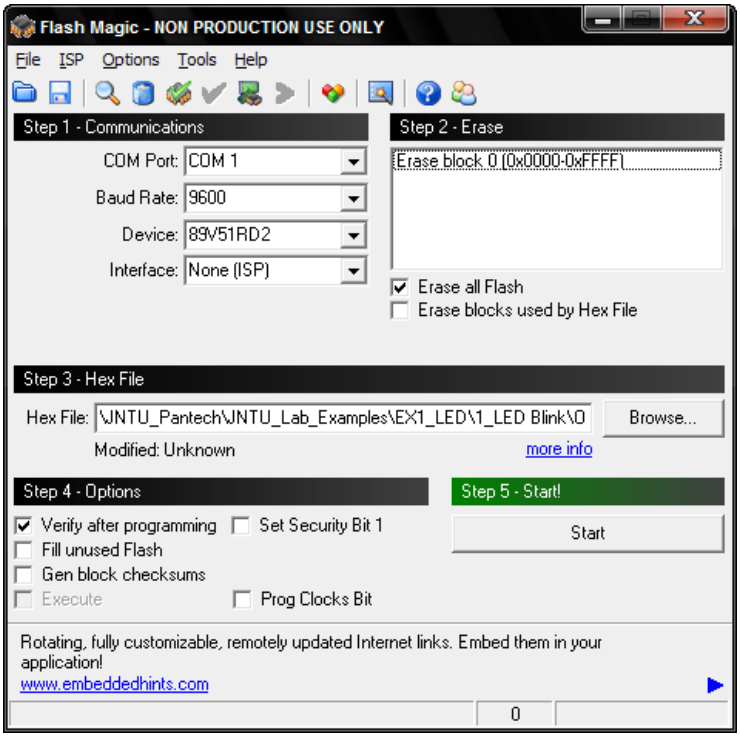


Step1 : Select Com Port E.g COM1 or COM2

- Set baud rate "**9600"**
- Select Device **"89V51RD2"**

  Interface **"None(ISP)"**

Step2 : Check **"Erase all Flash"**



Step3 : load or locate your Hex files

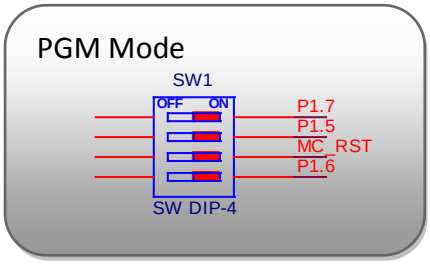
Step4 : select options you want like above figure, verify, erase, security bit.

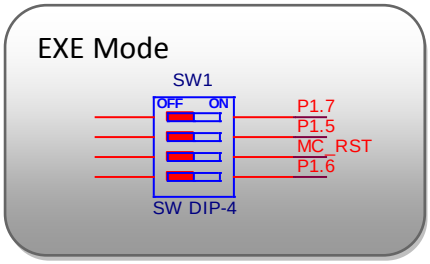
Step 5: press "**Start**" button

Press Hardware "**RST**" Button **SW3**. Now it starts, Erasing, Program & Verifying.

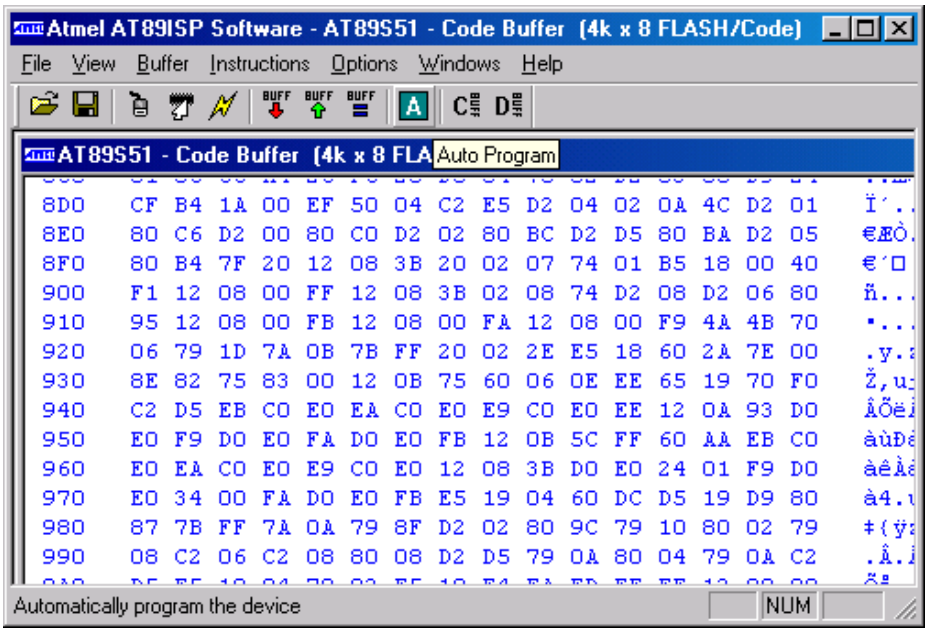
2 - Atmel Microcontrollers

Hardware Settings





Software Settings



1. “Options” - Menu

Select Port

-LP1

Device Selection

AT89S51

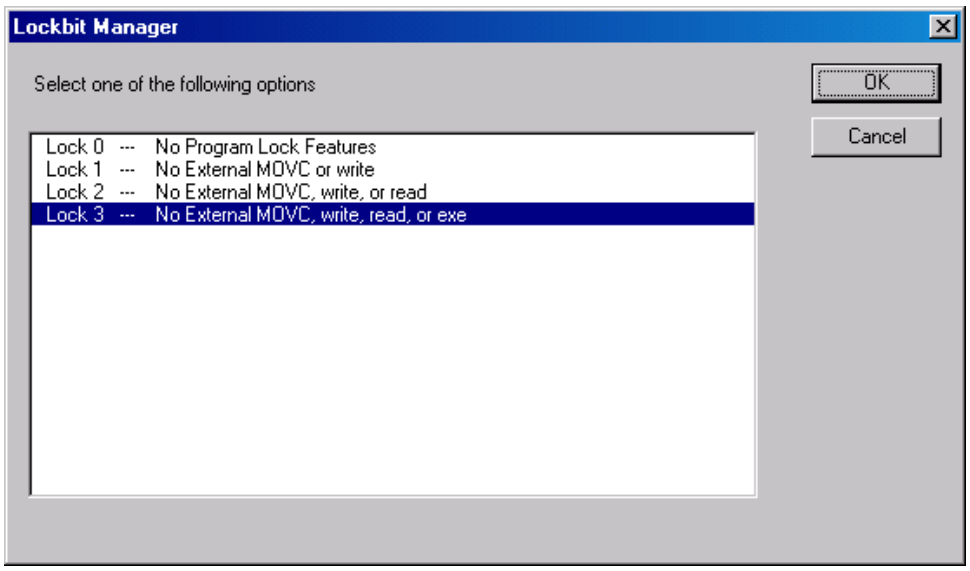
Clock : 12MHz

2. "File" Menu – "Load Buffer" Load your hex file

…\Examples Code\LED Blink\Out\LEDBlink.hex

3. "Instructions" – "Auto Program"

In Lock Bit settings


Lockbit Manager
Select one of the following options
OK
Cancel
Lock 0 --- No Program Lock Features
Lock 1 --- No External MOVC or write
Lock 2 --- No External MOVC, write, or read
Lock 3 --- No External MOVC, write, read, or exe

Executions

"**Instructions**" Menu

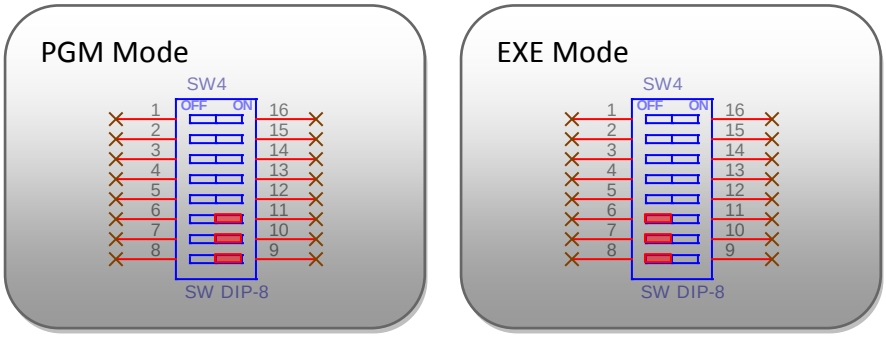
"**Run Target**" – Your program Now executes

Note : "**Options**" – Menu

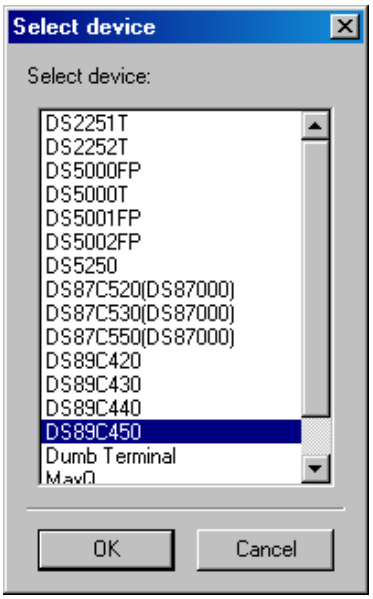
"**Initialize**" – It comes to program mode

3 - Dallas Microcontrollers

Hardware Settings

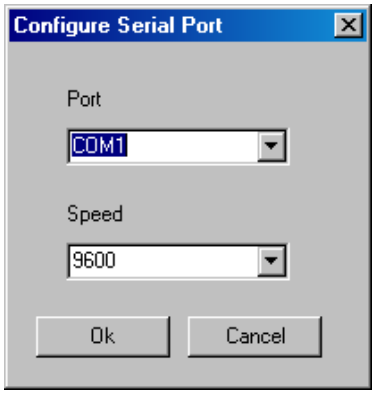


Select Dallas mcu “DS89C450”



1. “Options” – Menu

Select com port and set baud rate to 9600



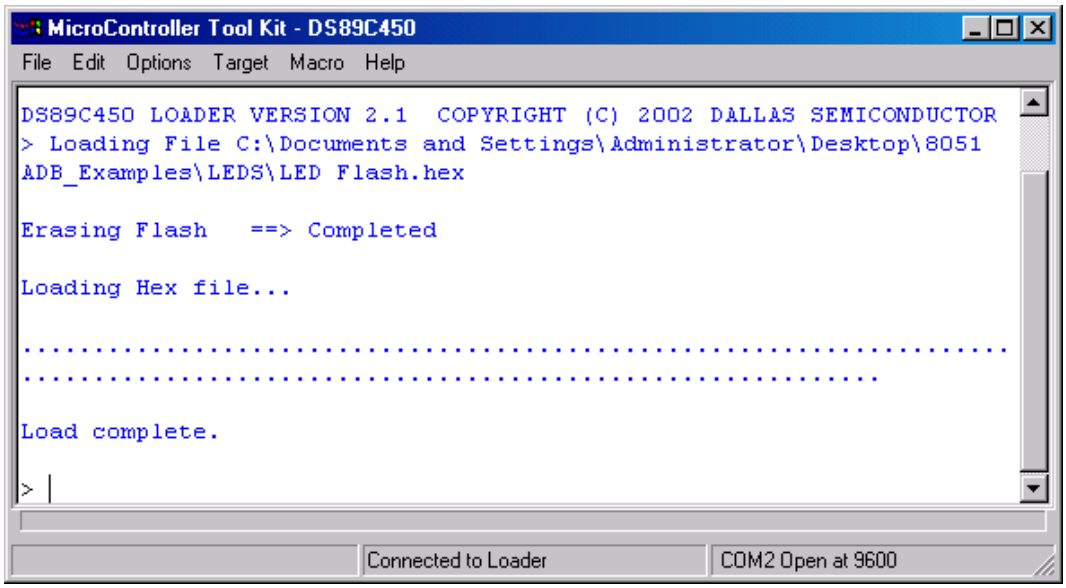
2. "Target" – Menu

1. Open Com1at 9600
2. Connect to Loader

We get window like this

3. "File" – Load Flash

…\Examples Code\LED Blink\Out\LEDBlink.hex


MicroController Tool Kit - DS89C450
File Edit Options Target Macro Help
DS89C450 LOADER VERSION 2.1 COPYRIGHT (C) 2002 DALLAS SEMICONDUCTOR
> Loading File C:\Documents and Settings\Administrator\Desktop\8051 ADB_Examples\LEDS\LED Flash.hex
Erasing Flash ==> Completed
Loading Hex file...
Load complete.
>
Connected to Loader
COM2 Open at 9600

Execution Mode

Set DIPSWITCH SW4 – **'EXE'** Mode

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